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ABSTRACT

This paper discusses the present state of the art in neurolinguistic studies of bilingualism and delineates areas of further research. The most pertinent studies are reviewed historically. The paper then focuses on some fundamental concepts, such as a definition of bilingualism, interference, recovery process, specific localization, and synchronic typology. Finally, the paper shows possible applications of theoretical insights in the praxis of applied linguistics and speech pathology. (Author)

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NEUROLINGUISTIC STUDIES OF BILINGUALISM

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ABSTRACT

The aim of the paper is to account for the present state of the art in neurolinguistic studies of bilingualism and to delineate areas of further research.

First, the most pertinent studies are reviewed historically. Then, the paper focuses on some fundamental concepts: definition of bilingualism, interference, recovery process, specific localization, and synchronic typology.

Finally, the paper shows possible fruitful applications of theoretical insights in the praxis of applied linguistics and speech pathology.

The growing influx of Spanish speaking people has changed the linguistic situation in the United States to such a degree that in many sectors of the public and private life bilingualism has come to be a generally accepted phenomenon. Given the necessity of obtaining more information about the problems that arise in a bilingual society, scholars of various areas have started investigating the question of bilingualism from different angles. This paper, examining the question from the viewpoint of neurolinguistics, tries to bring to light hitherto neglected connections between studies in applied linguistics and neurological research.

Neurolinguistics has been defined as the study that investigates the relationship between linguistic performance and the central nervous system (H. Whitaker and H. Whitaker, 1977). To approach the problem of bilingualism from a neurolinguistic viewpoint means therefore to take into account the results yielded by neurological and linguistic studies.¹ The first attempts to take such an approach can be traced back to the end of the nineteenth century. In 1881, Ribot investigated the question of memory disorders, and in 1895, Pitres presented his memorable study 'Etude sur l'aphasie chez les polyglottes.'

During the last years a fresh interest in bilingualism has emerged and numerous studies have tried to elucidate various questions concerning bilingualism. M. L. Albert and L. K. Obler (1978) approach the problem from a cross-disciplinary viewpoint. Their

work The Bilingual Brain encompasses studies of psycholinguistic phenomena (interference, transfer, and translation), sociolinguistic phenomena (age and manner of acquisition of languages) as well as neurological considerations (cerebral organization, potential switch mechanisms, cerebral lateralization). Shortly before their work, M. Paradis (1977) gave a thorough overview of the present state of the art and drew attention to problems that still await a solution. M. Critchley (1974) seems to be interested mainly in popularizing certain ideas when he touches in random fashion upon some problems connected with bilingualism. Mention should be made of his curious belief in the creation of a COSMOGLOTTA, 'a watered-down but improved, simplified, logical and universally accepted version of contemporary English.' (Critchley, 1974, p. 27). R. L'Hermitte, H. Hécaen, J. Dubois, A. Culioli and A. Tabouret-Keller (1966) examine eight cases of bilingual aphasics to shed light on the definition of bilingualism, on the process of recovery, and on interference. M. Minkowski (1965) is interested primarily in the exceptions to the 'rule' of Pitres and draws attention to the affective factor in the recovery process while stressing at the same time the particular character of each individual case. I. Gloning and K. Gloning (1965) try to answer the question posed by Poetzl (1930) as to whether the lesions that lead to polyglot reactions in aphasics can be localized in the gyrus angularis and the gyrus supramarginalis.

An examination of these and other works reveals that in many aspects bilingualism is still an unexplored phenomenon and that a great deal of research is needed in order to gain new insights. What is needed in particular is the redefinition of some currently used concepts which are so vague and so general that they seem to impede progress rather than to advance it. This paper attempts to contribute to the progress in the study of bilingualism by critically analyzing some fundamental concepts, by showing their shortcomings, and by proposing alternative solutions. The complexity of the problem of bilingualism makes it impossible to treat to an equal degree each aspect that deserves and needs a thorough examination. This analysis is, therefore, limited to only a few notions and concepts and makes no claim of providing solutions which would preclude further redefinition of terms and review of data. Definition of bilingualism, recovery process, interference--these are the focal points of the present investigation.

1. Definition of bilingualism.

One of the thorny problems of linguistics is to define bilingualism and to distinguish it from multilingualism (plurilingualism, polyglotism). So far no solution has been proposed for a distinction between bilingualism and plurilingualism, and it seems wise to follow the general usage which applies the term 'bilingual' regardless of whether an individual speaks two or more languages. 'L'usage courant

a imposé bilinguisme et bilingues comme des termes généraux appliqués aussi bien à des sujets qui parlent une ou plusieurs langues qu' à des situations de bi-, tri- ou plurilinguisme. A ce dernier terme la littérature médicale préfère celui de polyglottisme.' (L'Hermitte et al., 1966, p. 315).

The attempts to define bilingualism vary according to the respective fields of specialization of the authors. In a recent study on bilingualism within the framework of applied linguistics, B. Spolsky (1977) discusses not only the problem of definition but also that of description and measurement of bilingualism. He shows how different authors try to establish different distinctions between bilingualism, diglossia, and bidialectalism.² Other topics for which Spolsky as an applied linguist shows a particular interest are 'cognitive advantages or disadvantages of being bilingual, bilingualism as a problem, producing bilinguals--elite bilingualism, the legal aspects of bilingualism, bilingualism and biculturalism.'

Neurolinguists and neurologists approach the problem of defining bilingualism from a somewhat different angle. L'Hermitte et al. (1966), for example, distinguish between definitions that are more general and those that are more specific. General definitions describe bilingualism as the alternate usage of two languages, or as a skill possessed by those who are not monolingual. Definitions that are more specific insist on one of the aspects of the bilingual situation or of the usage of the languages (e.g. age, milieu, modali-

ties, etc.).

The consideration of the age of acquisition of the second language leads to a distinction between the bilingual child and the diglottic child. The first learns the two languages at the same time, the latter acquires a second language only after reaching a good mastery in his mother tongue.

If the circumstances in which the two languages were learned are deemed crucial, a distinction is made between compound and coordinate bilingualism. Compound refers to the acquisition of two languages in only one socio-cultural context (e.g. French Canadians who learn English and French in Montreal); coordinate refers to a learning situation in which each language is acquired in a specific socio-cultural context (e.g. English in the United States and French in France).³

A further distinction has been established between local (regional) bilingualism and the cultural bilingualism of the elite. Local bilingualism is applied to a situation where two or more languages are used in a population for every day oral communication (e.g. diglossia of the different castes in the regions of India). Cultural bilingualism of the elite means that each language mastered comprises an ensemble of very sophisticated knowledge such as can be found in foreign language teachers. It should be noted in this context, that the term 'cultural bilingualism of the elite' as explained by L'Hermitte et al. (1966) is not identical with the term 'elite

bilingualism' used by authors in applied linguistics. Here it refers to the attempt made by certain countries (e.g. Canada, South Africa) to produce a bilingual society, an attempt that focuses on an elite. 'Its target group then are members of the middle or upper socio-economic class. . .' (Spolsky, 1977, p. 174).

The importance of the historical and sociological context has also received due attention, and a distinction has been proposed between stylistic and social bilingualism. Stylistic means that a group of the population who has the same mother tongue acquires the same second language. Social means that in one and the same population two linguistically different groups exist side by side. (L'Hermitte et al., 1966, p. 316).

In view of such a variety of distinctions already made, L'Hermitte et al. deem it preferable to focus on the principal factors that play a part in the constitution of a bilingual individual rather than to propose a definition that might never be generally valid anyway. According to these authors, the most important factors are the following:

- a. The age of acquisition of the respective languages. This has as a corollary the distinction between precocious (the child learns to speak in two languages at the same time) and belated bilingualism (the second language is acquired only after the age of three or four).
- b. The sociological circumstances and the modalities of

acquisition (simultaneous or successive; learning through the oral, written or auditory modality).

- c. The circumstances and the modalities of usage, taking into account their chronology (level of usage; listening comprehension, oral expression, written expression, reading).
- d. The affective value of the different languages used and the eventual evolution of this factor (notion of prestige).

In addition to these factors, duly stressed by L'Hermitte et al., it seems appropriate to consider also the nature of the two languages, i.e. their degree of similarity. After all, learning Spanish and Italian permits more interlanguage associations than learning Spanish and French or German: 'por favor' is obviously closer to 'per favore' than to 's'il vous plaît' or 'bitte.' Also, long disuse of a language represents a crucial variable. Albert and Obler (1978) state correctly that usage patterns and the linguistic relationship between the two languages should be counted among the parameters of language acquisition.

Regarding the order of importance of these factors, no solution has as yet been proposed. In 1966, L'Hermitte et al. expressed the hope that the study of aphasia might be able to shed light on a possible hierarchy: 'On doit attendre des études sur l'aphasie chez des bilingues qu'elles contribuent à éclairer la part que les divers facteurs dégagés ont dans la structuration de la fonction linguistique.' (L'Hermitte et al., 1966, p. 316).

Given the multiplicity of factors and distinctions that have to be taken into consideration for a definition of bilingualism, one is not surprised to encounter a rather negative attitude towards the search for clarity and accuracy. Albert and Obler (1978), for example, deem it wise to subscribe to the 'purposely vague definition' proposed by Weinreich who defines bilingualism as 'the practice of alternately using two languages.' (Albert and Obler, 1978, p. 4).

In our opinion, however, it does not seem necessary to rest content with a definition whose vagueness can give rise to serious misconceptions. After all, what is meant by the terms 'using', 'alternately', and 'practice'? Is it sufficient to utter alternately 'very good' and 'muy bien' to qualify for the title 'bilingual'? We have reason to believe that it is possible to assess bilingualism more accurately, even if the assessment we propose is still rather general and incapable of replacing a complete case report of each individual bilingual case. Purposely adopting a rather pragmatic outlook, we suggest the following criteria for determining 'native fluency' in a given language: For the listening comprehension, the ability to understand at least 90 percent of news on the radio or on television spoken by a native speaker; for the speaking skill, the ability to speak at a medium speed for at least three minutes extemporaneously on a given topic of general interest without committing more than five or so serious errors in pronunciation, voca-

bulary, or grammar; for the reading skill, the ability to comprehend at least 90 percent of an article in a standard newspaper or magazine (Newsweek for English, L'Express for French, Der Spiegel for German, or any other equivalent) without the use of a dictionary; for the writing skill, the ability to write a perfectly comprehensible letter of approximately two hundred words without committing more than ten or so severe grammatical or orthographical errors.

Only if an assessment of this nature is performed will it be possible to apply meaningfully the terms 'dominant' and 'balanced' bilingual, as is suggested by Albert and Obler (1978, p. 4). Moreover, we think that these terms too could be replaced by a more precise grading system which assesses each individual language mastered by the bilingual according to the levels native, fluent, intermediate, and beginning. Thus, an English native speaker who claims fluency in Spanish and intermediate status in French might be assessed in the following way:

Spanish: listening--fluent

reading--fluent

speaking--fluent

writing--intermediate

French: listening--intermediate

speaking--intermediate

reading--beginner

writing--beginner

Such an assessment would do away with the meaningless and misleading descriptions that can still be found in certain case reports where authors describe their patients as 'perfectly mastering' two or even three languages.⁴

A thorough assessment seems to be of utmost importance not only for studies in applied linguistics, but also for diagnostic and therapeutic purposes in aphasiology as well as speech pathology. In fact, whenever a person suffers a language loss, it is vital to know how much language proficiency he or she possessed before the episode. Tests are usually performed only after the trauma and provide therefore no accurate information about the actual loss of language due to the accident. By the same token, the process of recovery cannot be judged meaningfully without information about the premorbid state of the patient.

2. Theories about recovery of polyglot aphasics.

The question of recovery of bilingual aphasics is so complex that it seems imperative to separate clearly the different aspects that are involved. Since the time of Pitres, scholars have been struggling to shed light on the problem of diachronic and synchronic order of recovery, mode of restitution, interference, and other questions. The problem approached first was that of diachronic order of recovery. In 1895, Pitres stated that the most familiar language would be recovered first. However, this 'rule', as it is

called in the literature, could not be verified in all cases of polyglot aphasia. 'Familiarity' with a language appeared to be only one among many other components in the recovery process. Moreover, Pitres actually failed to define the term 'most familiar', so that it has been assumed that 'familiarity' could mean the frequency of utilization and the antiquity of acquisition (L'Hermitte, et al., 1966, p. 316), or that 'most familiar language' could mean the most fluent language (Paradis, 1977, p. 79).

In addition to providing interpretations and explanations of Pitres' rule, authors have been trying to discover other factors that are decisive: the clinical type of aphasia, the particular circumstances in which the language is used, the social and affective factors, the linguistic milieu, the method of learning the languages, the last used language before the insult, etc. Since it is virtually impossible to determine the degree of importance of all these factors, one is inclined to subscribe to Minkowski's point of view that the whole personality is involved, including impulses of an instinctive nature: 'D'un cas à l'autre il s'agit d'un problème englobant la personnalité dans son ensemble, hautement différencié et difficile à résoudre.' (Minkowski, 1965, p. 487).

Among the rectifications proposed for the rule of Pitres, the study of Lambert and Fillenbaum (1959) is of particular interest. These authors drew attention to the discordancy between the verbal behavior of their own aphasics (French speaking Canadians from

Montreal) and that of European aphasics. In the Montrealers the rule of Pitres could be verified in most instances whereas in the European aphasics the recovered language was not necessarily the earliest learned nor was it the most frequently used before the illness. Moreover, the affective factors which according to Minkowski intervene frequently in the recovery process appeared only in exceptional circumstances in the Montrealers. According to Lambert and Fillenbaum, this opposition would be explainable through the fundamental distinction between compound and coordinate bilingualism as proposed by Osgood (1954): Europeans learn in general the second language later and in a context that is different from that of the first language (coordinate bilingualism); the Montrealers, on the other hand, learn the second language precociously and use it concurrently with the first compound bilingualism).

Besides Lambert and Fillenbaum, other investigators have contributed information concerning the recovery process. It is Paradis (1977) who gives the most thorough overview of their results when he discusses the following viewpoints: the psychological factor, the visual factor, the automaticity factor, the severity factor, the appropriateness factor, and the multiple factors view. By way of a summary statement, Paradis concludes:

'Various components in every individual state of bilingualism have been proposed as influencing factors in the particular pattern of recovery: age; modalities and sociological context of acquisition; context and modalities of usage; affective value attached to each language used; degree of proficiency in the various elements of the languages concerned (phonology, syntax, semantics, vocabulary, fluency, oral comprehension); and type of bilingualism. It is most likely that all these factors (and more) do interact. To what extent, in what proportion, and subject to what hierarchical organization cannot be determined on the basis of the evidence so far available. Too many heterogeneous factors are involved which interact with and support or cancel each other, and which are often, by their very nature, imponderable.' (Paradis, 1977, p. 112).

Even if there still prevails a considerable lack of clarity regarding the factors that influence the process of recovering language proficiency, some clear-cut concepts have been proposed for the mode of restitution: synergistic, antagonistic, successive, mixed, and selective. Recovery is labeled synergistic when progress in one language is concomitant with progress in another. This progress can be parallel (both languages are equally impaired and restored at the same time) or differential (the languages are differently impaired and restitution progresses at the same or at a different rate). Recovery is designated antagonistic when one language progresses while the other regresses; successive when a language appears only after another one has been restored; selective when only one or two of several languages are regained.⁵ If there is a recovery where two or more languages are intermingled, the term mixed is applied. Mixed recovery is closely related to a phenomenon--most familiar to every foreign language student--that linguists have been discussing under the heading of 'interference'.

3. Interference.

Interference occurs between two or more language systems that are in contact in the same individual and involves 'unintentional usage of one language in the course of using the other.' (Albert and Obler, 1978, p. 12). Interference can be encountered not only in individuals with language disturbances but also in normal bilin-

guals. Students of applied linguistics have been trying for a long time to gain more insight into the problem of 'interlanguage' and 'intralanguage' errors. They have drawn attention to the fact that not all language errors are the result of interference. 'Errors occur both as a result of interference from the mother tongue and as a result of incomplete interim grammars of the learner.' (Chastain, 1976, p. 62).

The areas in which interference can occur are vocabulary (lexicon), syntax, morphology, and phonology; the ways in which interference manifests itself can be unidirectional or reciprocal. In phonology, interference errors occur when the two phonological systems are treated like one, and when the earliest learned language gives rise to prosodic elements. Instances of interferences as found in aphasic patients are reported by Paradis (1977), L'Hermitte et al. (1966), Albert and Obler (1978), and others. The following examples are taken primarily from case reports provided by these authors.

VOCABULARY:

'zu sehen, come se dice, no, no, Augenglas' (Gloning and Gloning, 1965, p. 376)

for German: 'wie sagt man'.

Interference from Italian: 'come se dice' (what do you call it).

SYNTAX:

'since I am here' (Paradis, 1977, p. 96)

for 'since I have been here'

from French: 'depuis que je suis là'.

MORPHOLOGY:

'conscious. . . heit. . . ung' (Paradis, 1977, p. 77)

for 'consciousness'

from German morphemes -ung, -heit (e.g. Untersuchung, Freiheit).

PHONOLOGY:

'example' /ig.zem'pəl/

for /ig.zam'pəl/

from French 'exemple'.

Rather neglected in the neurolinguistic literature on bilingualism are interferences of a syntagmatic and orthographic nature. Yet, they can be counted among the most frequent in foreign language learners.

SYNTAGMATIC:

'to take a decision'

for 'to make a decision'

from French 'prendre une décision'.

ORTHOGRAPHY:

'responsability'

for 'responsibility'

from French 'responsabilité' or Spanish 'responsabilidad'.

Although it seems reasonable to consider most of these errors committed by foreign language students and bilingual aphasics as the result of interference, we think that the influence of agramma-

tic tendencies should also be taken into consideration. In fact, the problem of agrammatism as conceived by Goodglass could be redefined in the light of evidence supplied by neurolinguistic studies on bilingualism.⁶ An investigation of the relationship between interference and agrammatism could actually be helpful for the solution of another problem, that of specific localization of languages.

4. Specific localization.

The question of specific localization of each language acquired by an individual had been considered even before Pitres. As a matter of fact, Pitres' main intention in 'Etude sur l'aphasie chez les polyglottes' seems to be to disprove the theory of his contemporary Scoresby-Jackson who postulated a specific language center for each newly acquired language. After having been cast into oblivion, the idea reappeared recently, though with profound modifications. Poetzl (1930) postulates the existence of a center that would have to be located on the level of the inferior parietal region and that would permit the free transition from one language to another. If this center is affected, there appears a persistent prevalence of one language and at the same time an inhibition of the other. On the other hand, if there is only an isolated injury of the temporal lobe, the restitution of the different languages follows the law of Pitres. This hypothesis was the target of a study by I. Gloning and K. Gloning (1965). The two Viennese neurologists

reached the conclusion that there is no statistical evidence for a connection between the appearance of polyglot reactions (i.e. intermingling, selective restitution, differential impairment, and differential recovery) and a lesion in the inferior parietal lobe.

(Gloning and Gloning, 1965, p. 395).

Gloning and Gloning also address the question of hemispheric dominance and establish the hypothesis that polyglots are not necessarily more lateralized than monolinguals; rather, they increasingly use the non-dominant hemisphere so that its impairment affects the patient's language performance. Faced with data indicating that in left-handed polyglots impairment of the right hemisphere is more frequent than in left-handed monolinguals, the authors conclude:

'Unsere Erklaerung fuer diese Tatsache besteht nicht darin, dass Polyglotte weniger stark als Monoglotte lateralisiert sind, sondern dass bei Menschen, die zwei oder mehrere Sprachen perfekt sprechen, auch in staerkerem Masse dazu die nicht dominante Hemisphaere herangezogen werden muss and deshalb auch von dort stoerbar ist.'

(Gloning and Gloning, 1965, p. 393).

Whereas handedness and lateralization still represent a stumbling block for aphasiologists, another question, that of synchronic typology, could already be elucidated.

5. Synchronic typology.

According to L'Hermitte et al. (1966), the question of synchronic

typology, dealing with the disorganization of the different languages spoken by polyglot aphasics, has been approached only recently.

Implicitly it had been assumed that the disturbances would reveal the same clinical type of aphasia in every language. It was necessary to await Wald (1958) to see this hypothesis being contested. The latter drew attention to the fact that each language can be affected by a particular type of aphasia. For example, in one of his patients one type (in Russian) was that of a conduction aphasia, and in the others (Yiddish and English) it was that of a motor aphasia.

6. Conclusion.

The foregoing discussion has tried to shed light on some of the problems that are being investigated by scholars in various fields of specialization. As has been shown, several problems have already found a solution. Yet, a host of questions still await answers or clarifications. The question of 'structural analogies', i.e. similarities or dissimilarities between linguistic systems, that of 'translation', of 'switch mechanisms', of 'lateralization of speech mechanisms' and 'handedness' are hardly explored.

What is needed in particular is the practical application of insights gained in theoretical discussions. In fact, the question of the rehabilitation of bilingual patients seems to have fallen into oblivion. For example, the instructive case reports of two

bilingual aphasics which were presented by Durieu (1969) in a study devoted to rehabilitation have been entirely neglected. Even the most recent study, in spite of its attempt to cull cases 'from the literature of the last century' (Albert and Obler, 1978, p. 109), omits Durieu's case report of a Spanish native speaker who regains his mother tongue faster than French, the language of his therapeutic and social milieu; and that of a sixty year old priest who finds it easier to celebrate mass in Latin than in his French mother tongue.

One of the few studies that touch upon the question of rehabilitation is that of Luisa A. Monteverde-Ganoza (1974). She thinks that therapy has to concentrate on eliminating the 'blocking' of certain channels and circuits that interfere with encoding and decoding processes. In bilinguals, the process of deblocking should be easier since there exist two communicative linguistic systems: 'En el caso de los bilingües, el procedimiento insinuado ofrece mayores posibilidades de atacar el bloqueo del respectivo canal, puesto que hay de por medio dos sistemas comunicativos lingüísticos.' (Monteverde-Ganoza, 1974, p. 6). It is supposedly the same theory that is put forward by Albert and Obler (1978) who suggest that the right hemisphere be involved in therapeutic techniques. For monolingual aphasics who do not recover their mother tongue, learning of a second language might successfully stimulate the right hemisphere and at the same time deblock the old language mechanisms. These assumptions

concerning the lateralization of speech lead the two authors to conceive of new ways to teach second languages.

'If it is true that the right hemisphere plays a major role in the acquisition of a second language, at any age, then it might be useful to develop a program of second language teaching that emphasizes so-called "right hemisphere strategies." For example, a second language might be more easily learned if it were taught through nursery rhymes, music, dance, or techniques emphasizing visuospatial skills.' (Albert and Obler, 1978, p. 254).

Insights of such a nature have been put into practice for a long time in foreign language teaching, and it appears possible that methods used by foreign language teachers (grammar-translation method, audio-lingual approach, transformational-generative grammar) could be fruitfully integrated in therapeutic techniques. In particular, recently developed methods might prove beneficial not only for the teaching of foreign languages but also for the rehabilitation of polyglot aphasics. Among the most revolutionary approaches, the following should be mentioned: the 'suggestopedia' or Lozanov Method, developed by psychotherapist G. Lozanov in Bulgaria, which makes use of musical elements; and the 'verbotonal' method, developed by P. Guberina in Zagreb, that incorporates body movements in the learning process. Another area where research could be fruitful is non-verbal communication as conceived by Rosenfeld and Civikly (1976). Also, the use of Bliss-symbols might be recommendable in certain circumstances.

Whether or not one is successful in applying such methods in the therapeutic work with polyglot aphasics, it seems desirable that contacts between foreign language teachers, students of applied linguistics, neurolinguists, and speech pathologists be intensified. Everything should be done to improve the recovery prospects of all aphasics and to take into account the special needs of each one of them, including the polyglot. Improvement will be brought about more easily if there is a constant exchange of ideas among experts

in various fields. That this exchange not be impeded either by geographic, political, or language barriers is one of the special concerns of this author.

FOOTNOTES

¹For an account of the historical evolution of neurolinguistic study, see Y. Lebrun (1976).

²According to Spolsky (1977), an example of diglossia would be the simultaneous use of Schwyztzertütsch and standard German in the German speaking cantons in Switzerland. An example of bidialectalism can presumably be found in Haiti where the Creole is regarded as sufficiently different from standard French to make the two languages mutually unintelligible. (Cf. p. 168).

³For a more detailed discussion of 'types of bilingualism', see Paradis (1977), pp. 95-99.

⁴Cf. for example Gloning and Gloning (1965) who state: 'Die sprachbegabte Slowenin hatte neben ihrer Muttersprache perfekt deutsch und spanisch beherrscht.' (p. 373).

⁵For concrete examples and graphic representations of the various modes of restitution, see Paradis (1977), pp. 65-76.

⁶It can be hoped that the use of the 'Story Completion Test' which has been developed recently by Goodglass and his collaborators will be able to shed light on the relationship between agrammatism and interference. A description of the elaboration and application of this test can be found in H. Goodglass, B. Gleason, et al. (1972). For a discussion of the present state of the art in agrammatism, see Goodglass (1976) and Zurif and Caramazza (1976).

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